

Response of marine phytoplankton to atmospheric deposition of anthropogenic aerosols

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Phytoplankton productivity in the oceans, amounting to 50 petagram of carbon per year, plays an important role in sustaining the habitability of Earth. The variability of phytoplankton is always attributed to climate-related factors. Impact of deposition of anthropogenic nutrients (DAN), in particular for nitrogen (N), iron (Fe) and phosphorus (P), on open-ocean biogeochemistry has been realized. However, due to a large variability in climate-related factors, identification of the single signals of DAN in phytoplankton remains a major challenge. In this study, we use a state-of-the-art ocean biogeochemical model by considering the variation of DAN over the industrial era. When comparing against available observations in the oceans, the modelled concentrations of nutrients (N, P and Fe) and chlorophyll can be improved by considering DAN. In addition, by controlling the climate-related factors, a positive signal in observed chlorophyll concentrations to increasing DAN can be successfully identified across 182,552 measurements, which can be captured in the model. It implies the change of DAN should be considered when modelling the carbon cycle and N fixation in the Earth system.